Temporal Variability in Survival of Non-Breeding Northern Bobwhites in Ohio

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Introduction

• Survival important vital rate in declining bobwhite populations (Sandercock et al. 2008)
  – Seasonal variation important determinant of population growth rates (Folk et al. 2007, Sandercock et al. 2008)
  – Non-breeding season survival is important vital rate in northern populations
• Guthery 2000, Folk et al. 2007, Sandercock et al. 2008, Gates et al. This Session
Introduction

• Intra-seasonal variation may additionally be important (Moynahan et al. 2006 – GRSG)
  – Target limiting periods

• Investigated non-breeding season (October – March) survival on private lands in Ohio – 2008-2011
Study Area

• Private land in core of bobwhite range in Ohio
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• Habitat composition representative of land-use in region
Study Area

- Private land in core of bobwhite range in Ohio
- Habitat composition representative of land-use in region
- Primarily used woody cover along fencerows and ditches
Methods

• Located coveys
• Captured and radiomarked 2-5 individuals/ covey
• Located individuals daily to record habitat use and cause-specific mortality
Survival analysis

- **Known-fates model in Program MARK**
  - Daily intervals for 1 October – 31 March
    - 2008-09 Season 10 December – 31 March, extrapolated to entire interval following Sandercock et al. 2008
  - 7 day exclusion period (Guthery and Lusk 2004, Holt et al. 2009)

- **Temporal models \( n = 17 \)**
  - constant, weekly, bi-weekly, monthly
  - Additive effects and interactions with year
    - e.g. Week, Week + Year, Week + Year + Week x Year
    - Selected most parsimonious model with AICc

- **Data bootstrapping procedure to improve variance estimate**
  - Resampled based on covey affiliation (Williams et al. 2003)

- **Cumulative incidence function (CIF) for harvest mortality**
  - (Heisey and Patterson 2006)
Results

- Low survival in each non-breeding season (Oct. – Mar)
- 311 individuals from 73 coveys
  - (08-09 n=55, 09-10 n=130, 10-11 n=126)
Mortality causes

- Avian Predator: 24%
- Mammalian Predator: 16%
- Unknown Predator: 39%
- Harvest: 5%
- Investigator: 3%
- Other: 1%
- Weather: 2%

Harvest CIF = 0.068 (0.012, 0.123)
Results

• Heterogeneous temporal models within and among years
• Slight dependency among covey members – $\hat{c} = 1.54$

<table>
<thead>
<tr>
<th>Model</th>
<th>$\text{AIC}_c$</th>
<th>$\Delta\text{AIC}_c$</th>
<th>$w_i$</th>
<th>$K$</th>
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<tbody>
<tr>
<td>S(Week)Year+Week*Year</td>
<td>1585.479</td>
<td>0.000</td>
<td>0.935</td>
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<td>S(BiWeek) Year+BiWeek*Year</td>
<td>1590.822</td>
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<td>1617.168</td>
<td>31.689</td>
<td>0.000</td>
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</tbody>
</table>
S* = 0.294

2008-09

*extrapolated to 182 d. interval
$S = 0.055 \ (0.026, \ 0.113)$

2009-10
S = 0.121 (0.069, 0.203)
Discussion

• Variable survival among years consistent with previous long-term studies
Discussion

• Highly variable survival among years consistent with previous long-term studies
• Survival influenced primarily by predation
  – Harvest not highly influential
  – Covey-level Allee Effects
• Survival during periods of snow cover most variable
  – Predation, rather than freezing or starvation (e.g. Leopold 1937, Trautman et al. 1939)
Management Implications

• Improve survival (decrease predation) during periods with snow accumulation to improve non-breeding season survival, population growth rates

• Providing suitable woody cover close to food resources may reduce vulnerability to avian predators
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Questions

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